

CORRESPONDENCE/MEMORANDUM

State of Wisconsin

DATE: May 2, 2019

TO: Angela Parkhurst-- WCR

FROM: Wade Strickland -- WY/3

SUBJECT: Water Quality-Based Effluent Limitations for the Maple Grove Estates Sanitary District
WPDES Permit No. WI-0036552

This is in response to your request for an evaluation of the need for water quality-based effluent limitations (WQBELs) using Chapters NR 102, 104, 105, 106, 207, 210, 212, and 217 of the Wisconsin Administrative Code (where applicable), for the discharge from the Maple Grove Estates Sanitary District in La Crosse County. This municipal wastewater treatment facility (WWTF) discharges to a wetland tributary to Pleasant Valley Creek, located in the Lower La Crosse River Watershed in Bad Axe-La Crosse Rivers Basin. The evaluation of the permit recommendations is discussed in more detail in the attached report.

Based on our review, the following recommendations are made on a chemical-specific basis:

Parameter	Daily Maximum	Daily Minimum	Weekly Average	Monthly Average	Footnotes
BOD ₅			30 mg/L	15 mg/L	1
TSS			30 mg/L	20 mg/L	1
pH	9.0 s.u.	6.0 s.u.			1
Dissolved Oxygen		4.0 mg/L			1
Ammonia Nitrogen					2,3
May – September	Variable		13 mg/L	5.0 mg/L	
October–April	Variable		40 mg/L	16 mg/L	
Chloride			576 mg/L		1

Footnotes:

1. No changes from the current permit
2. The ammonia nitrogen variable daily maximum table corresponding to various effluent pH values may be included in the permit in place of the single limit. These limits would apply year-round. This table has been expanded due to the changes in s. NR 106.33(2).

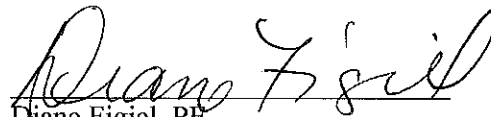
Effluent pH s.u.	Limit mg/L	Effluent pH s.u.	Limit mg/L	Effluent pH s.u.	Limit mg/L
6.0 < pH ≤ 6.1	54	7.0 < pH ≤ 7.1	33	8.0 < pH ≤ 8.1	6.9
6.1 < pH ≤ 6.2	53	7.1 < pH ≤ 7.2	30	8.1 < pH ≤ 8.2	5.7
6.2 < pH ≤ 6.3	52	7.2 < pH ≤ 7.3	26	8.2 < pH ≤ 8.3	4.7
6.3 < pH ≤ 6.4	51	7.3 < pH ≤ 7.4	23	8.3 < pH ≤ 8.4	3.9
6.4 < pH ≤ 6.5	49	7.4 < pH ≤ 7.5	20	8.4 < pH ≤ 8.5	3.2
6.5 < pH ≤ 6.6	47	7.5 < pH ≤ 7.6	17	8.5 < pH ≤ 8.6	2.7
6.6 < pH ≤ 6.7	45	7.6 < pH ≤ 7.7	14	8.6 < pH ≤ 8.7	2.2
6.7 < pH ≤ 6.8	42	7.7 < pH ≤ 7.8	12	8.7 < pH ≤ 8.8	1.8
6.8 < pH ≤ 6.9	39	7.8 < pH ≤ 7.9	10	8.8 < pH ≤ 8.9	1.6
6.9 < pH ≤ 7.0	36	7.9 < pH ≤ 8.0	8.4	8.9 < pH ≤ 9.0	1.3

Please consult the attached report for details regarding the above recommendations. If there are any questions or comments, please contact Benjamin Hartenbower at (715) 839-3712 or Diane Figiel at (608) 264-6274 or Diane.Figiel@wisconsin.gov.

Attachments (2) – Narrative & Map

PREPARED BY: Benjamin Hartenbower, PE,
Water Resources Engineer

APPROVED BY:

 Date: 5/2/19
Diane Figiel, PE,
Water Resources Engineer

E-cc: Julia Stephenson, Wastewater Engineer – La Crosse
Camille Bruhn, Water Quality Biologist– La Crosse
Lacey Hillman, Regional Wastewater Supervisor – Eau Claire
Diane Figiel, Water Resources Engineer – WY/3

**Water Quality-Based Effluent Limitations for
Maple Grove Estates Sanitary District**

WPDES Permit No. WI-0036552

Prepared by: Benjamin P. Hartenbower

PART 1 – BACKGROUND INFORMATION

Facility Description:

This facility is an extended aeration activated sludge system with an annual average design flow of 0.035 MGD. The waste is domestic and comes from the area condominiums. The Maple Grove Country Club and Golf Course closed in September 2013. In 2018, the club reopened on a limited basis as a venue for celebrations. The plant was built in 1992 and is currently operating below capacity at about 9000 gallons per day of flow. When needed, excess sludge is hauled to the West Salem Wastewater Treatment Facility.

Disinfection of the effluent is not required based on the conditions of s. NR 210.06(3). It should be noted that the recreational use surveys may be re-evaluated in the future to ensure the conditions are being met. This re-evaluation could result in requiring disinfection of the effluent at that time.

Attachment #2 is a map of the area showing the approximate location of Outfall 001.

Existing Permit Limitations: The current permit, expiring on March 31, 2019, includes the following effluent limitations.

Parameter	Daily Maximum	Daily Minimum	Weekly Average	Monthly Average	Footnotes
BOD ₅			30 mg/L	15 mg/L	1
TSS			30 mg/L	20 mg/L	1
pH	9.0 s.u.	6.0 s.u.			1
Dissolved Oxygen		4.0 mg/L			1
Ammonia Nitrogen					2
May – September	variable		13 mg/L	5.0 mg/L	
October–April	variable			16 mg/L	
Chloride			576 mg/L		
Temperature					3

Footnotes:

1. These limitations are not being evaluated as part of this review. Because the water quality criteria (WQC), reference effluent flow rates, and receiving water characteristics have not changed, limitations for these water quality characteristics do not need to be re-evaluated at this time.
2. The variable ammonia nitrogen daily maximum table corresponding to various effluent pH values is included in the permit in place of the single limit. During the months of May through October if the pH is less than or equal to 7.9 there is no daily maximum limit for NH₃-N. Limits shown in the table above with an asterisk* apply from November through April only.

Attachment #1

Effluent pH s.u.	Limit mg/L	Effluent pH s.u.	Limit mg/L
7.0 < pH ≤ 7.1	No Limit	8.2 < pH ≤ 8.3	9.4
7.5 < pH ≤ 7.6	34*	8.3 < pH ≤ 8.4	7.8
7.6 < pH ≤ 7.7	29*	8.4 < pH ≤ 8.5	6.4
7.7 < pH ≤ 7.8	24*	8.5 < pH ≤ 8.6	5.3
7.8 < pH ≤ 7.9	20*	8.6 < pH ≤ 8.7	4.4
7.9 < pH ≤ 8.0	17	8.7 < pH ≤ 8.8	3.7
8.0 < pH ≤ 8.1	14	8.8 < pH ≤ 8.9	3.1
8.1 < pH ≤ 8.2	11	8.9 < pH ≤ 9.0	2.6

3. Monitoring in 2017 only

Receiving Water Information:

- Name: Wetland Tributary to Pleasant Valley Creek
- Classification: Limited Forage Fish Community, Non-Public Water Supply
- Low Flow: Due to the nature of the receiving water, 7-Q₁₀, 7-Q₂ and Harmonic Mean are estimated to be zero.
 7-Q₁₀ = 0 cfs (cubic feet per second)
 7-Q₂ = 0 cfs
 Harmonic Mean Flow = 0 cfs
- Hardness = 269 mg/L as CaCO₃. This value represents the geometric mean of effluent data from the 2018 permit application. Effluent hardness is used in place of receiving water because there is no receiving water flow upstream of the discharge.
- % of low flow used to calculate limits: 25%
- Source of background concentration data: Background concentrations are not included because they don't impact the calculated WQBEL when the receiving water low flows are equal to zero.
- Multiple dischargers: None
- Impaired water status: Approximately one mile downstream of the discharge the Bostwick Creek is listed as impaired for Total Phosphorus
- Due to the low discharge volume and the size of the wetland, there is no expected reasonable potential for downstream impacts.

Effluent Information:

- Design Flow Rate(s):
 Annual average = 0.035 MGD (Million Gallons per Day)
 For reference, the actual average flow from June 2014 to December 2018 was 0.01 MGD.
- Hardness = 269 mg/L as CaCO₃. This value represents the geometric mean of effluent data from June 2018 submitted with the permit application.
- Acute dilution factor used: Not applicable – this facility does not have an approved Zone of Initial Dilution (ZID).
- Water Source: Domestic wastewater from private wells
- Additives: None
- Effluent characterization: This facility is categorized as a minor municipality, so the permit application required effluent sample analyses for a limited number of common pollutants, primarily metal substances plus Ammonia, Hardness and Phosphorus. The permit-required monitoring for

Attachment #1

Chloride from June 1, 2014 to December 31, 2018 is used in this evaluation as well as additional arsenic data submitted following submittal of the permit application.

Sample Date	Copper µg/L	Sample Date	Arsenic µg/L
06/04/2018	8.97	06/04/2018	3.02
06/11/2018	9.74	02/04/2019	2.12
06/18/2018	7.19	02/12/2019	2.76
06/25/2018	9.6		
07/02/2018	14.4		
07/09/2018	15.5		
07/16/2018	7.45		
07/23/2018	11		
07/30/2018	12.4		
08/06/2018	11.8		
08/13/2018	18		
Mean	11.6	Mean	2.63
1-day P ₉₉	21.6		
4-day P ₉₉	16.0		

	Chloride- mg/L
1-day P ₉₉	1161.4
4-day P ₉₉	826.6
30-day P ₉₉	650.84
Mean	563.40
Std	194.17
Sample size	86
Range	221 - 967

Effluent data for substances for which a single sample was analyzed is shown in the tables in Part 2 below, in the column titled "MEAN EFFL. CONC.".

The following table presents the average concentrations and loadings at Outfall 001 from June 2014 to December 2018 for all parameters with limits in the current permit to meet the requirements of s. NR 201.03(6):

	Average
BOD ₅	1.82 mg/L*
TSS	4.88 mg/L
pH field	7.65 s.u.
Dissolved Oxygen	
Ammonia Nitrogen	0.597 mg/L*
Chloride	

*Results below the level of detection (LOD) were included as zeroes in calculation of average.

PART 2 – WATER QUALITY-BASED EFFLUENT LIMITATIONS FOR TOXIC SUBSTANCES – EXCEPT AMMONIA NITROGEN

In general, permit limits for toxic substances are recommended whenever any of the following occur:

1. The maximum effluent concentration exceeds the calculated limit (s. NR 106.05(3), Wis. Adm. Code)
2. If 11 or more detected results are available in the effluent, the upper 99th percentile (or P₉₉) value exceeds the comparable calculated limit (s. NR 106.05(4), Wis. Adm. Code)
3. If fewer than 11 detected results are available, the mean effluent concentration exceeds 1/5 of the calculated limit (s. NR 106.05(6), Wis. Adm. Code)

Acute Limits based on 1-Q₁₀

Daily maximum effluent limitations for toxic substances are based on the acute toxicity criteria (ATC), listed in ch. NR 105, Wis. Adm. Code. Previously daily maximum limits for toxic substances were calculated as two times the ATC. However, changes to ch. NR 106, Wis. Adm. Code (September 1, 2016) require the Department to calculate acute limitations using the same mass balance equation as used for other limits along with the 1-Q₁₀ receiving water low flow to determine if more restrictive effluent limitations are needed to protect the receiving stream from discharges which may cause or contribute to an exceedance of the acute water quality standards.

$$\text{Limitation} = \frac{(\text{WQC}) (Q_s + (1-f) Q_e) - (Q_s - f Q_e) (C_s)}{Q_e}$$

Where:

WQC = Acute toxicity criterion or secondary acute value according to ch. NR 105

Q_s = average minimum 1-day flow which occurs once in 10 years (1-day Q₁₀)

if the 1-day Q₁₀ flow data is not available = 80% of the average minimum 7-day flow which occurs once in 10 years (7-day Q₁₀).

Q_e = Effluent flow (in units of volume per unit time) as specified in s. NR 106.06(4)(d)

f = Fraction of the effluent flow that is withdrawn from the receiving water, and

C_s = Background concentration of the substance (in units of mass per unit volume) as specified in s. NR 106.06(4)(e).

As a rule of thumb, if the receiving water is effluent dominated under low stream flow conditions, the 1-Q₁₀ method of limit calculation produces the most stringent daily maximum limitations and should be used while making reasonable potential determinations. This is the case for Maple Grove Estates Sanitary District.

The following tables list the water quality-based effluent limitations for this discharge along with the results of effluent sampling for all the detected substances. All concentrations are expressed in terms of micrograms per Liter (µg/L), except for hardness and chloride (mg/L)

Attachment #1

Daily Maximum Limits based on Acute Toxicity Criteria (ATC)

RECEIVING WATER FLOW = 0 cfs, (1-Q₁₀ (estimated as 80% of 7-Q₁₀)).

SUBSTANCE	REF. HARD.* mg/L	ATC	MEAN BACK- GRD.	MAX. EFFL. LIMIT**	1/5 OF EFFL. LIMIT	MEAN EFFL. CONC.	1-day P ₉₉	1-day MAX. CONC.
Arsenic		340		340	68.0	2.63		
Cadmium	269	32.1		32.1	6.4	<0.06		
Chromium	269	4056		4056	811	<0.45		
Copper	269	39.5		39.5			21.61	18.0
Lead	269	278		278	55.7	<0.48		
Nickel	268	1080		1080	216	0.61		
Zinc	269	286		286	57.2	50.40		
Chloride (mg/L)		757		757			1161.4	967

* The indicated hardness may differ from the effluent hardness because the effluent hardness exceeded the maximum range in ch. NR 105 over which the acute criteria are applicable. In that case, the maximum of the range is used to calculate the criterion.

** Per the changes to s. NR 106.07(3), Wis. Adm. Code, effective 09/01/2016 consideration of ambient concentrations and 1-Q₁₀ flow rates yields a more restrictive limit than the 2 × ATC method of limit calculation.

Weekly Average Limits based on Chronic Toxicity Criteria (CTC)

RECEIVING WATER FLOW = 0 cfs (¼ of the 7-Q₁₀)

SUBSTANCE	REF. HARD.* mg/L	CTC	MEAN BACK- GRD.	WEEKLY AVE. LIMIT	1/5 OF EFFL. LIMIT	MEAN EFFL. CONC.	4-day P ₉₉
Arsenic		152		152	30.4	2.63	
Cadmium	175	3.82		3.82	0.8	<0.06	
Chromium	269	297		297	59.4	<0.45	
Copper	269	24.2		24.2			15.98
Lead	269	72.9		72.9	14.6	<0.48	
Nickel	268	120		120	24.0	0.61	
Zinc	269	286		286	57.2	50.4	
Chloride (mg/L)		395		395			826.7

* The indicated hardness may differ from the receiving water hardness because the receiving water hardness exceeded the maximum range in ch. NR 105, Wis. Adm. Code, over which the chronic criteria are applicable. In that case, the maximum of the range is used to calculate the criterion.

Monthly Average Limits based on Wildlife Criteria (WC)

The effluent characterization did not include any effluent sampling results for substances for which Wildlife Criteria exist.

Monthly Average Limits based on Human Threshold Criteria (HTC)

RECEIVING WATER FLOW = 0 cfs (1/4 of the Harmonic Mean)

SUBSTANCE	HTC	MEAN BACK- GRD.	MO'LY AVE. LIMIT	1/5 OF EFFL. LIMIT	MEAN EFFL. CONC.
Cadmium	370		370	74.0	<0.06
Chromium (+3)	3818000		3818000	763600	<0.45
Lead	140		140	28.0	<0.48
Nickel	43000		43000	8600	0.61

Monthly Average Limits based on Human Cancer Criteria (HCC)

RECEIVING WATER FLOW = 0 cfs (1/4 of the Harmonic Mean)

SUBSTANCE	HCC	MEAN BACK- GRD.	MO'LY AVE. LIMIT	1/5 OF EFFL. LIMIT	MEAN EFFL. CONC.
Arsenic	13.3		13.3	2.66	2.63

In addition to evaluating the need for limits for each individual substance for which HCC exist, s. NR 106.06(8) requires the evaluation of the cumulative cancer risk. Because only one substance for which Human Cancer Criteria exists was detected, determination of the cumulative cancer risk is not needed per s. NR 106.06(8), Wis. Adm. Code.

Conclusions and Recommendations: Based on a comparison of the effluent data and calculated effluent limitations, effluent limitations are needed for Chloride.

Chloride – Considering available effluent data from the current permit term (June 2014 to December 2018), the 1-day P₉₉ chloride concentration is 1161 mg/L, and the 4-day P₉₉ of effluent data is 827 mg/L.

Because the 4-day P₉₉ exceeds the calculated weekly average WQBEL, an effluent limit is needed in accordance with s. NR 106.05(4)(b) Wis. Adm. Code.

However, Subchapter VII of ch. NR 106 provides for a variance from water quality standards for this substance, and Maple Grove Estates Sanitary District has requested such a variance. That variance may be granted subject to the following conditions:

- 1) The permit shall include an "Interim" limitation intended to prevent an increase in the discharge of Chloride;
- 2) The permit shall specify "Source Reduction Measures" to be implemented during the permit term, with periodic progress reports; and
- 3) The permit shall include a "Target Limit" or "Target Value" to gauge the effectiveness of the Source Reduction Measures, and progress toward the WQBELs.

Interim Limit for Chloride: Section NR 106.82(9) defines a "Weekly average interim limitation" as either the 4-day P₉₉ concentration or 105% of the highest weekly average concentration of the representative data.

Attachment #1

Ideally, the effluent chloride concentration at facilities with variances will trend downward as time goes on because of source reduction measures, and the recalculated interim limit will decline until the plant can meet the WQBEL. Unfortunately, effluent concentrations at Maple Grove Estates Sanitary District have apparently increased in the past few years (the 4-day P₉₉ from June 2014 to December 2018 is higher than the 2014 interim limit).

Although the 4-day P₉₉ effluent chloride concentrations at Maple Grove Estates Sanitary District are higher than the current interim limit of 576 mg/L, the Department does not find it appropriate to increase the interim concentration limit in the reissued permit, since it would be counterproductive to meeting the final WQBEL. **Therefore, the current weekly average interim chloride limit is recommended for permit reissuance.**

In the absence of a variance, Maple Grove Estates Sanitary District would be subject to the WQBELs of 757 mg/L as a daily maximum and 395 mg/L as a weekly average; the weekly average mass limit of 221 lbs/day (757 mg/L × 0.035 MGD × 8.34); and an alternative wet weather mass limit.

Mercury – The permit application did not require monitoring for mercury because the Maple Grove Sanitary District is categorized as a minor facility as defined in s. NR 200.02(8), Wis. Adm. Code. In accordance with s. NR 106.145(3)(a)3., a minor municipal discharger shall monitor, and report results of influent and effluent mercury monitoring once every three months if, “there are two or more exceedances in the last five years of the high-quality sludge mercury concentration of 17 mg/kg specified in s. NR 204.07(5).” A review of the past five years of sludge characteristics data reveals that all the sample results are within expected analytical ranges and well below the 17 mg/kg level. The average concentration in the sludge from 2017 and 2018 was 3.29 mg/kg, with a maximum reported concentration of 5.39 mg/kg. Therefore, no mercury monitoring is recommended at Outfall 001.

PART 3 – WATER QUALITY-BASED EFFLUENT LIMITATIONS FOR AMMONIA NITROGEN

The State of Wisconsin promulgated revised water quality standards for ammonia nitrogen effective March 1, 2004 which includes criteria based on both acute and chronic toxicity to aquatic life. The current permit has daily maximum, weekly average and monthly average limits for Outfall 001 (calculated in 2010). These limits are re-evaluated at this time due to the following changes:

- Updates to subchapter IV of ch. NR 106, Wis. Adm. Code allow limits based on available dilution instead of limits set to twice the acute criteria.
- Updates to s. NR 106.07(3), Wis. Adm. Code require weekly and monthly average limits for municipal treatment plants.

Daily Maximum Limits based on Acute Toxicity Criteria (ATC):

Daily maximum limitations are based on acute toxicity criteria, which are a function of the effluent pH and the receiving water classification. The acute toxicity criterion (ATC) for ammonia is calculated using the following equation.

$$\text{ATC in mg/L} = [A \div (1 + 10^{(7.204 - \text{pH})})] + [B \div (1 + 10^{(\text{pH} - 7.204)})]$$

Where:

A = 0.411 and B = 58.4 for a Limited Forage Fishery, and
pH (s.u.) = that characteristic of the effluent.

Attachment #1

The effluent pH data was examined as part of this evaluation. A total of 502 sample results were reported from June 2014 to December 2018. The maximum reported value was 7.91 s.u. (Standard pH Units). The effluent pH was 7.89 s.u. or less 99% of the time. The 1-day P_{99} , calculated in accordance with s. NR 106.05(5), is 7.97 s.u. And the mean plus the standard deviation multiplied by a factor of 2.33, an estimate of the upper ninety ninth percentile for a normally distributed dataset, is 7.97 s.u. Therefore, a value of 7.97 s.u. is believed to represent the maximum reasonably expected pH, and therefore most appropriate for determining daily maximum limitations for ammonia nitrogen. Substituting a value of 7.97 s.u. into the equation above yields an ATC = 8.90 mg/L and a computed daily maximum limit of 8.90 mg/L using 1- Q_{10} flow as zero cfs

Potential changes to daily maximum Ammonia Nitrogen effluent limitations:

Updates to subchapter IV of ch. NR 106, Wis. Adm. Code (effective September 1, 2016) outline the option for the Department to implement use of the 1- Q_{10} receiving water low flow to calculate daily maximum ammonia nitrogen limits if it is determined that the previous method of acute ammonia limit calculation ($2 \times \text{ATC}$) is not sufficiently protective of the fish and aquatic life. The more restrictive calculated limits would apply.

The calculated daily maximum ammonia nitrogen effluent limits using the mass balance approach with the 1- Q_{10} (estimated as 80 % of 7- Q_{10}) and the $2 \times \text{ATC}$ approach are shown below.

	Ammonia Nitrogen Limit mg/L
$2 \times \text{ATC}$	17.8
1- Q_{10}	8.90

The 1- Q_{10} method yields the most stringent limits for the Maple Grove Estates Sanitary District.

Presented below is a table of daily maximum limitations corresponding to various effluent pH values. Use of this table is not necessarily recommended in the permit, but it is presented herein for informational purposes. This table has been expanded from the previous table due to the changes in s. NR 106.33(2).

Daily Maximum Ammonia Nitrogen Limits – WWSF, WWFF & LFF

Effluent pH s.u.	Limit mg/L	Effluent pH s.u.	Limit mg/L	Effluent pH s.u.	Limit mg/L
6.0 < pH ≤ 6.1	54	7.0 < pH ≤ 7.1	33	8.0 < pH ≤ 8.1	6.9
6.1 < pH ≤ 6.2	53	7.1 < pH ≤ 7.2	30	8.1 < pH ≤ 8.2	5.7
6.2 < pH ≤ 6.3	52	7.2 < pH ≤ 7.3	26	8.2 < pH ≤ 8.3	4.7
6.3 < pH ≤ 6.4	51	7.3 < pH ≤ 7.4	23	8.3 < pH ≤ 8.4	3.9
6.4 < pH ≤ 6.5	49	7.4 < pH ≤ 7.5	20	8.4 < pH ≤ 8.5	3.2
6.5 < pH ≤ 6.6	47	7.5 < pH ≤ 7.6	17	8.5 < pH ≤ 8.6	2.7
6.6 < pH ≤ 6.7	45	7.6 < pH ≤ 7.7	14	8.6 < pH ≤ 8.7	2.2
6.7 < pH ≤ 6.8	42	7.7 < pH ≤ 7.8	12	8.7 < pH ≤ 8.8	1.8
6.8 < pH ≤ 6.9	39	7.8 < pH ≤ 7.9	10	8.8 < pH ≤ 8.9	1.6
6.9 < pH ≤ 7.0	36	7.9 < pH ≤ 8.0	8.4	8.9 < pH ≤ 9.0	1.3

Weekly Average & Monthly Average Limits based on Chronic Toxicity Criteria (CTC)

Attachment #1

Weekly and monthly average limits based on chronic toxicity criteria for ammonia are also calculated to determine the weekly and monthly average limits to meet the requirements of s. NR 106.07(3).

Weekly average and monthly average limits for ammonia nitrogen are based on chronic toxicity criteria. The 30-day chronic toxicity criterion (CTC) for ammonia in waters classified as a Limited Forage Fish Community is calculated by the following equation.

$$CTC = E \times \{ [0.0676 \div (1 + 10^{(7.688 - pH)})] + [2.912 \div (1 + 10^{(pH - 7.688)})] \} \times C$$

Where:

pH = the pH (s.u.) of the receiving water,

E = 1.0,

C = the minimum of 3.09 or $3.73 \times 10^{(0.028 \times (25 - T))}$ – (Early Life Stages Present), or

C = $3.73 \times 10^{(0.028 \times (25 - T))}$ – (Early Life Stages Absent), and

T = the temperature (°C) of the receiving water – (Early Life Stages Present), or

T = the maximum of the actual temperature (°C) and 7 – (Early Life Stages Absent)

The 4-day criterion is simply equal to the 30-day criterion multiplied by 2.5. The 4-day criteria are used in a mass-balance equation with the 7-Q₁₀ (4-Q₃, if available) to derive weekly average limitations. And the 30-day criteria are used with the 30-Q₅ (estimated as 85% of the 7-Q₂ if the 30-Q₅ is not available) to derive monthly average limitations. The stream flow value is further adjusted to temperature; 100% of the flow is used if the Temperature ≥ 16 °C, 25% of the flow is used if the Temperature < 11 °C, and 50% of the flow is used if the Temperature ≥ 11 °C but < 16 °C.

The rules provide a mechanism for less stringent weekly average and monthly average effluent limitations when early life stages (ELS) of critical organisms are absent from the receiving water. This applies only when the water temperature is less than 14.5 °C, during the winter and spring months. Burbot, an early spawning species, are not believed to be present in the wetland tributary to Pleasant Valley Creek. So “ELS Absent” criteria apply from October through March, and “ELS Present” criteria will apply from April through September for a Limited Forage Fish classification.

Since minimal ambient data is available, the “default” basin assumed values are used for Temperature, pH and background ammonia concentrations, shown in the table below, with the resulting criteria and effluent limitations.

		Summer	Winter
		May – Sept.	Oct. – Apr.
Effluent Flow	Qe (MGD)	0.035	0.035
Background Information	7-Q ₁₀ (cfs)	0	0
	7-Q ₂ (cfs)	0	0
	Ammonia (mg/L)	0	0
	Temperature (°C)	23	10
	pH (s.u.)	7.6	7.6
	% of Flow used	100	25
	Reference Weekly Flow (cfs)	0	0
	Reference Monthly Flow (cfs)	0	0
4-day Chronic			
Early Life Stages Present		5.0	5.0

Attachment #1

		Summer	Winter
		May – Sept.	Oct. – Apr.
Criteria mg/L	Early Life Stages Absent	6.9	16.0
	30-day Chronic		
	Early Life Stages Present	12.6	12.6
	Early Life Stages Absent	17.3	40.1
Effluent Limitations mg/L	Weekly Average		
	Early Life Stages Present	5.0	
	Early Life Stages Absent		16
	Monthly Average		
	Early Life Stages Present	13	
	Early Life Stages Absent		40

Effluent Data

The following table evaluates the statistics based upon ammonia data reported from June 2014 to December 2018, with those results being compared to the calculated limits to determine the need to include ammonia limits in the Maple Grove Estates Sanitary District permit for the respective month ranges. That need is determined by calculating 99th upper percentile (or P₉₉) values for ammonia during each of the month ranges and comparing the daily maximum values to the daily maximum limit. Based on this comparison, reasonable potential for ammonia has not been determined.

Ammonia Nitrogen mg/L	May - September	October - April
1-day P ₉₉	4.45	8.77
4-day P ₉₉	2.59	4.99
30-day P ₉₉	1.08	2.08
Mean*	0.35	0.78
Std	1.52	2.67
Sample size	204	266
Range	<0.07 - 9.84	<0.07 - 13.8

Where there are existing ammonia nitrogen limits in the permit, the limits are recommended to be retained regardless of reasonable potential, consistent with s. NR 106.33(1), Wis. Adm. Code:

- (b) If a permittee is subject to an ammonia limitation in an existing permit, the limitation shall be included in any reissued permit. Ammonia limitations shall be included in the permit if the permitted facility will be providing treatment for ammonia discharges.

Expression of Limits:

Revisions to ch. NR 106 align Wisconsin's WQBELs with 40 CFR 122.45(d), which requires WPDES permits for municipal treatment facilities contain weekly average and monthly average limitations, whenever concentration limits are deemed practicable and necessary to protect water quality. Because a daily maximum ammonia limit is necessary for Maple Grove Estates Sanitary District, a weekly average limit for October-April is also required under this code revision.

The methods for calculating limitations for municipal treatment facilities to conform to 40 CFR 122.45(d) are specified in s. NR 106.07(3), and are as follows:

Attachment #1

Whenever a daily maximum limitation is determined necessary to protect water quality, a weekly and monthly average limitation shall also be included in the permit and set equal to the daily maximum limit unless a more restrictive limit is already determined necessary to protect water quality.

In this case, the recommended daily maximum limits vary with effluent pH, so additional limits should be set equal to the highest recommended limit. However, the **weekly average limit of 40 mg/L** for October-April is more restrictive than the highest daily max of 54 mg/L.

Conclusions and Recommendations:

In summary, after rounding to two significant figures, the following ammonia nitrogen limitations are recommended. No mass limitations are recommended in accordance with s. NR 106.32(5).

Months Applicable	Daily Maximum	Weekly Average	Monthly Average
May – September	Variable	13	5
October – April	Variable	40	16

PART 4 –PHOSPHORUS

Technology Based Effluent Limit (TBL)

Wisconsin Administrative Code, ch. NR 217, requires municipal wastewater treatment facilities that discharge greater than 150 pounds of Total Phosphorus per month to comply with a monthly average limit of 1.0 mg/L, or an approved alternative concentration limit.

Because the Maple Grove Estates Sanitary District does not currently have an existing technology-based limit, the need for this limit in the reissued permit is evaluated. The data demonstrates that the annual monthly average phosphorus loading is less than 150 lbs/month, which is the threshold for municipalities in accordance to s. NR 217.04(1)(a)1, and therefore no technology-based limit is recommended.

Sample Date	Phosphorus mg/L	Sample Date	Phosphorus mg/L	Sample Date	Phosphorus mg/L
06/04/2018	2.39	07/02/2018	5.35	07/30/2018	3.58
06/11/2018	2.45	07/09/2018	4.13	08/06/2018	3.22
06/18/2018	3.24	07/16/2018	2.46	08/13/2018	4.29
06/25/2018	3.26	07/23/2018	3.96	08/20/2018	3.41
Mean = 3.48					

Attachment #1

Sample Date	Result mg/L	Total Flow MG/month	Total Phosphorus lb./mo.
Jan 2018	3.48	0.269	5.36
Feb 2018	3.48	0.298	6.09
Mar 2018	3.48	0.267	7.21
April 2018	3.48	0.281	7.64
May 2018	3.48	0.302	13.47
June 2018	3.48	0.263	9.06
July 2018	3.48	0.297	6.09
Aug 2018	3.48	0.308	10.17
Sept 2018	3.48	0.301	8.99
Oct 2018	3.48	0.307	8.24
Nov 2018	3.48	0.295	10.55
Dec 2018	3.48	0.28	7.96
Average =			8.40

Total P (lbs/month) = Total Phosphorus average (mg/L) × total flow (MGD) × 8.34 (lbs/gallon)
Where total flow is the sum of the actual (not design) flow (in MGD) for that month

In addition, the need for a WQBEL for phosphorus must be considered.

Water Quality-Based Effluent Limits (WQBEL)

Revisions to administrative rules regulating phosphorus took effect on December 1, 2010. These rule revisions include additions to ch. NR 102 (s. NR 102.06), which establish phosphorus standards for surface waters. Revisions to ch. NR 217 (s. NR 217, Subchapter III) establish procedures for determining WQBELs for phosphorus, based on the applicable standards in ch. NR 102.

Phosphorus criteria in s. NR 102.06 do not apply to ephemeral streams, limited aquatic life systems, and wetlands [s. NR 102.06 (6) (d)]. These waters were not included in the USGS/WDNR stream and river studies and, therefore, the Department lacked the technical basis to determine and propose applicable criteria. At some time in the future, the Department may adopt phosphorus criteria based on new studies focusing on limited aquatic life waters. The guidance suggests that during the interim, WQBELs should be based on the criteria and flow conditions for the next stream segment downstream (or downstream lake or reservoir, if appropriate). A site visit on 11/29/2011 by Department staff resulted in the determination that there does not appear to be a reasonable potential for the discharge to contribute to an exceedance of phosphorus criteria in downstream waters. This was based on the low volume of wastewater discharged, the size of the wetland complex, and observations by field staff. Therefore, no water-quality based phosphorus limits are warranted for inclusion in the permit.

PART 5 –THERMAL

LAL discharge

New surface water quality standards for temperature took effect on October 1, 2010. These new regulations are detailed in Chapters NR 102 (Subchapter II – Water Quality Standards for Temperature) and NR 106 (Subchapter V – Effluent Limitations for Temperature) of the Wisconsin Administrative Code. The daily maximum effluent temperature limitation shall be 86 °F for discharges to surface waters

Attachment #1

classified as Limited Aquatic Life according to s. NR 104.02(3)(b)1, except for those classified as wastewater effluent channels and wetlands regulated under ch. NR 103 [s. NR 106.55(2), Wis. Adm. Code] which has a daily maximum effluent temperature limitation of 120 °F.

Reasonable Potential

Based on the available discharge temperature data from 2017 shown below, the maximum daily effluent temperature reported was 66 °F; therefore, no reasonable potential for exceeding the daily maximum limit exists, and **no limits are recommended**.

Month	Representative Highest Monthly Effluent Temperature		Calculated Effluent Limit	
	Weekly Maximum (°F)	Daily Maximum (°F)	Weekly Average Effluent Limitation (°F)	Daily Maximum Effluent Limitation (°F)
OCT	65	66	-	86
NOV	55	58	-	86
DEC	52	53	-	86

PART 6 – WHOLE EFFLUENT TOXICITY (WET)

WET testing is used to measure, predict, and control the discharge of toxic materials that may be harmful to aquatic life. In WET tests, organisms are exposed to a series of effluent concentrations for a given time and effects are recorded. The following evaluation is based on procedures in the Department's WET Program Guidance Document (revision #11, dated November 1, 2016).

- Acute tests predict the concentration that causes lethality of aquatic organisms during a 48 to 96-hour exposure. To assure that a discharge is not acutely toxic to organisms in the receiving water, WET tests must produce a statistically valid LC₅₀ (Lethal Concentration to 50% of the test organisms) greater than 100% effluent.
- Chronic testing is usually not recommended where the distance between the outfall and the point where the receiving water becomes a non-variance waterbody is greater than four miles. For the Maple Grove Estates Sanitary District, that effective distance of the discharge through the 50-acre wetland complex is greater than four miles. Given this distance, there is believed to be little potential for chronic toxicity effects in the Pleasant Valley Creek associated with the discharge from the Maple Grove Estates Sanitary District, so the need for chronic WET testing will not be considered further.

The WET Checklist was developed to help DNR staff make recommendations regarding WET limits, monitoring, and other permit conditions. The Checklist steps the user through a series of questions that evaluate the potential for effluent toxicity. The Checklist indicates whether acute and chronic WET limits are needed, based on requirements specified in s. NR 106.08, Wis. Adm. Code, and recommends monitoring frequencies based on points accumulated during the Checklist analysis. As toxicity potential increases, more points accumulate, and more monitoring is recommended to ensure that toxicity is not occurring. The completed WET Checklist recommendations for this permittee are summarized in the table below. Staff recommendations, based on the WET Checklist and best professional judgment, are provided below the

Attachment #1

summary table. For guidance related to reasonable potential and the WET Checklist, see Chapter 1.3 of the WET Guidance Document: <http://dnr.wi.gov/topic/wastewater/WETguidance.html>.

WET Checklist Summary	
	Acute
AMZ/IWC	Not Applicable. 0 Points
Historical Data	No tests available to calculate RP 5 Points
Effluent Variability	Little variability, no violations or upsets, consistent WWTF operations. 0 Points
Receiving Water Classification	Variance Water and > 4 miles from WWSF 0 Points
Chemical-Specific Data	No limits for substances based on ATC; Ammonia, Arsenic, Copper, Nickel, Zinc and Chloride detected. Additional Compounds of Concern: 0 3 Points
Additives	No Biocides and no Water Quality Conditioners added. SorbX-100 Used: No 0 Points
Discharge Category	No Industrial Contributors. 0 Points
Wastewater Treatment	Secondary or Better 0 Points
Downstream Impacts	No impacts known 0 Points
Total Checklist Points:	8 Points
Recommended Monitoring Frequency (from Checklist):	No Testing Recommended
Limit Required?	No Limit
TRE Recommended? (from Checklist)	No

- Following the guidance provided in the Department's WET Program Guidance Document (revision #11, dated November 1, 2016), based upon the point totals generated by the WET Checklist, other information given above, and Chapter 1.3 of the WET Guidance Document, **no acute or chronic WET tests are recommended** in the reissued permit.



